



Third United Nations
International Conference
on the Peaceful Uses
of Atomic Energy

A/CONF.28/A/347
USSR

February 1964

Original: RUSSIAN

Confidential until official release during Conference

Abstract

EXTRACTION OF SOME ELEMENTS WITH PHOSPHORUS-CONTAINING
MONOBASIC ACIDS

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The paper discusses the extraction mechanism of some elements with acidic phosphorus-containing compounds and gives the results of the investigations of the effect of the structure and the composition of these compounds on their extraction properties.

For the extractants considered the group $\text{>P} \begin{smallmatrix} \text{=O} \\ \text{OH} \end{smallmatrix}$ is common in which acidic hydrogen may be substituted by cation, while phosphoryl oxygen takes part in the co-ordination link with an element being extracted.

The cation-exchange mechanism of extracting corresponds to the substitution of hydrogen, while the solvate mechanism corresponds to the co-ordination through phosphoryl oxygen. When the substitution and the co-ordination are simultaneous, a chelate is formed.

Both the mechanisms may be observed when extracting uranium from hydrochloric and nitric acid solutions.

The cation-exchange mechanism prevails at low acidity. In a higher concentration range of mineral acid the degree of the dissociation of the organic extractant is appreciably lowered and the extraction of uranium (VI) is possible by the solvate mechanism which is confirmed by the distribution curves and the infra-red spectra.

Nitric acid is extracted only by the solvate mechanism, while weakly polarized cations Cs, Sr, Ce, Am are extracted by the cation-exchange one only.

The dependency of the extraction power on the structure of the extractant is related to the extraction mechanism. Thus, in extracting uranyl and zirconium nitrates with di-alkyl phosphinic acids and acidic esters of

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methyl phosphinic acid a maximum in the extraction power is observed, that corresponds to a certain number of carbon atoms in an extractant molecule.

The effect of the extractant structure has been studied in more detail by taking the extraction of three valent cations as an example, since only the cation-exchange mechanism of extraction is observed in this case.

The extraction properties of organic compounds were compared using the stability constants of the complexes being extracted at the zero ionic strength.

A study has been made of the dependency of the constant value on the nature of the anion, the length of the alkyl chain in the extractant radical and the introduction of electronegative groups.

The values of constants have been determined for different classes of organic extractants.

A study has also been made of the synergism in extracting uranium (VI) from nitric acid solutions with the binary mixture n-trioctylamine (TOA) - di-iso-amyl phosphoric acid (Di-APA). The synergistic effect was found to have a maximum at the certain ratios $\frac{\text{TOA}}{\text{Di. APA}}$ and nitric acid concentrations.